Regionalization in Local Public Health Systems: Variation in Rationale, Implementation, and Impact on Public Health Preparedness

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SYNOPSIS

Comparative case studies found that regionalization originated from a crisis or perceived need for a coordinated response, a need to build local public health capacity, or an effort to use federal preparedness funds more efficiently. Regions vary in terms of their congruence with regional structures for partner agencies, such as emergency management agencies, as well as hospital and health services markets and organizational structure. Some focus on building formal organizational relationships to coordinate and sometimes standardize preparedness and response activities or build regional capacity, while others focus on building informal professional networks. Whatever the approach, strong leadership and trust are required for effective planning, emergency response, and sustainability. This article suggests that regionalization improves emergency preparedness by allowing for more efficient use of resources and better coordination and demonstrated progress in terms of planning and coordination; regional capacity-building, training, and exercises; and development of professional networks.

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Reflecting rising concerns about bioterrorism and public health preparedness more generally, in the last few years the federal government has invested billions of dollars in the public health infrastructure at the state and local level. Nearly all states have responded to the increased interest in and funding for public health preparedness by setting up or enhancing intrastate regional structures.[1]

Despite their ubiquity, the reasons for creating regional structures vary considerably from place to place. Part of the rationale springs from the fact that disease outbreaks and bioterrorist attacks do not respect geopolitical borders and, thus, require a regional response. In addition, some states realized that if every local public health department (LPHD) got a proportional share, federal public health preparedness funds would be too thinly distributed to be effective. Some states and local areas developed regional approaches for various reasons before 9/11, and have an explicit plan to build functional capabilities at the regional level, or at least standardize or coordinate existing response structures, to improve local public health's ability to respond to an emergency and provide population-based services. Similarly, the form and function of regional structures, and presumably the impact on preparedness and the ability to deliver other public health services, vary considerably.

The research and scholarship on the implementation and the effect of regionalization have been very limited, so little is known about the strengths and weaknesses of various approaches. To gain a more complete understanding about the potential that regional public health structures offer, we have undertaken a comparative case study. The goal was to enable the state and LPHDs developing regional structures to learn from their colleagues' collective experience and, as a result, strengthen local public health preparedness in the U.S.

As described in more detail later, five case studies were prepared covering Massachusetts and one specific region in the Boston area, Northern Illinois, Nebraska, and the Washington, D.C., metropolitan area. Each study documents the rationale for creating regional public health structures; describes how these structures have been organized, implemented, and governed; and assesses the current and likely impact of regional structures on public health preparedness and public health systems more generally. The case study authors, public health officials and others from the geographic areas covered by the cases, and national public health practice experts subsequently met to review and discuss the cases and identify commonalities and differences. The individual cases are published in this issue of *Public Health Reports* and in the online archives.[2–6] This article summarizes the background for the project and the comparative analysis.

BACKGROUND

Although limited in scope, the available studies strongly suggest the importance of a regional approach to public health and the potential for regional structures. With respect to general public health functions, Baker and Koplan noted that only 25% of local public health jurisdictions in the U.S. report being able to deliver 60% or more of the essential public health services needed to protect community health in a terrorist event.[7] In response, they anticipate that consolidation will occur through regionalization of public health jurisdictions, potentially reducing the number of jurisdictions from approximately 3,000 to less than 1,000, each of which would provide the full range of essential public health services to its community through direct service delivery and partnership with others. Similarly, Mays and colleagues note that size is an important determinant of public health system performance; departments serving more people had higher performance scores.[8]

Salinsky and Gursky comment that despite improvements in collaboration and communication, jurisdictional confusion—potential conflicts among the responsibilities of federal, state, and local officials—inhibited the public health response to Hurricane Katrina and other public health emergencies.[9] Katz and colleagues observe the same concerns, adding that with approximately 25% of the U.S. population living in metropolitan areas that straddle state lines, the organizational framework of public health agencies does not provide rational loci for emergency response planning.[10]

Case studies of four recent infectious disease outbreaks in the U.S. illustrate many ways in which regional public health structures have improved, or could have improved public health preparedness. These include regional surveillance offices and laboratory structures that have helped with the identification and characterization of West Nile virus (WNV), regional epidemiology offices that have facilitated the investigation of potential severe acute respiratory syndrome cases, and a public health regional structure that enabled a rapid response to a major Hepatitis A outbreak. The same case studies, on the other hand, revealed many instances in which lack of coordination of the public health response within and among states led to confusion and delays with each of the disease outbreaks mentioned and for monkeypox.[11]

Similarly, in an in-depth study of local public health

preparedness in California, Lurie and colleagues noted that in light of the high fixed costs associated with many public health functions, small health jurisdictions are particularly disadvantaged in this regard.[12] As a result, it is probably not realistic to expect small counties to ever be sufficiently prepared for a major bioterrorist event, absent more regional approaches. For many functions, not just those related to preparedness, it was apparent that some sort of regionalization and sharing of resources could increase efficiency.

Bashir and colleagues conclude that adopting a regional approach to planning can help health departments avoid duplication of efforts, share resources, set priorities across regions, develop mutual aid agreements, provide assistance to each local jurisdiction within the region, coordinate efforts among state offices and regions, and achieve consistency among local, regional, and state planning.[13] Maldin and colleagues report similar findings in a study of regional approaches to hospital preparedness.[14]

In a systematic review of regionalization of bioterrorism preparedness and response, for instance, Bravata and colleagues first identified the key tasks of local responders during a bioterrorism event and then the resources that local responders need to perform these tasks.[15] They found numerous examples of systems and organizations with regionalized infrastructures engaged in the timely delivery of bioterrorism-relevant material, personnel, and information, covering each of the key tasks. These include mutual aid agreements to respond to natural disasters, efforts to expand laboratory capacity, and information technology (IT) to facilitate disease surveillance and emergency response. However, many existing systems and organizations, including some with long histories of successful participation in infectious disease outbreaks and natural disasters, were designed independently of each other and for different purposes, and efforts to coordinate them have generally not been evaluated.

Based on the available evidence, the authors conclude that regionalization is likely to benefit elements of a bioterrorism response including surge capacity (a health-care system's ability to expand quickly to meet an increased demand for care in public health emergencies) in the provision of medical care, distribution and dispensing of prophylactic therapies, outbreak investigation, and emergency management. Regionalization is also likely to be a cost-effective strategy for developing teams of trained response personnel and maintaining inventories of response equipment.

In focus groups conducted with Kansas health department employees, regionalization was perceived as "absolutely necessary," leading to improved collaboration and communication, and the development of relationships, trust, and mutual respect among LPHDs and other governmental agencies. Participants agreed that regionalization improved the delivery and availability of public health services, increased the efficiency and timeliness of operations, and enhanced public health's visibility in emergency preparedness efforts. Moreover, regionalization added resources to LPHDs including personnel, knowledge, technology, technical expertise, and fiscal resources.[16]

The National Association of County and City Health Officials (NACCHO) has also recognized the potential benefits of regionalization by changing its Project Public Health Ready (PPHR) recognition program to allow groups of LPHDs to be recognized as a region. To guide the regional approach to PPHR recognition, NACCHO has identified four approaches to regionalization, which may apply differently depending on local capabilities and needs, and for different public health functions:[17]

1. Networking—the most informal and often the first aspect of regionalization to be implemented—involves sharing preparedness information, approaches to planning, and so on. While networking can lead to coordination of efforts across jurisdictions, it is done on an individual basis for mutual benefit and not actively managed.

2. Coordinating occurs when local LPHDs within the region work together deliberately to plan events such as meetings, trainings, or exercises. Regional preparedness is achieved through actively managed coordination of individual LPHDs.

3. Standardizing creates some uniformity across individual health departments in the region through mutual adoption of one another's planning tools, press releases, and even response procedures, leading to interoperability among the health departments for one or more emergency preparedness functions. All response functions remain under the operational control of the individual health departments in which they reside.

4. Centralizing occurs when resources for planning or response are brought together or controlled by a centralized entity. Resources could be a single Web portal, an emergency notification system, a single regional training contractor, or regional staff to provide epidemiologic support. Regional preparedness is achieved by pooling resources to form a separate regional entity that

would function as if it were a regional public health agency for certain functions during an emergency.

METHODS

The results are based on five case studies[2–6] chosen to reflect diverse approaches to regionalization, public health systems, and geographical areas. Some are based on structured interviews with health officials and others in the region who are familiar with the issues, documents provided by those interviewed and/or available on the public record, and the author's observations. Other cases were prepared by individuals who were directly involved in creating the regions, and reviewed by others familiar with the issues.

Massachusetts
Massachusetts has separate and independent boards of health serving its 351 cities and towns, and until the development of regional structures there were no units between the local health boards and the state health department. Seven regions were established and funded by the state health department as part of its preparedness efforts in 2002.

Massachusetts Region 4b
A separate case study contrasts Region 4b—which is based in Cambridge, includes 26 other cities and towns in the Boston suburbs, and is largely self-initiated—with other regions that were created by the state health department.

Northern Illinois
The Northern Illinois Public Health Consortium is a membership organization made up of 11 LPHDs serving the greater Chicago metropolitan area. Incorporated as a 501(c)(4) nonprofit organization in 2001, the Consortium has a dues structure that supports a part-time lobbyist and executive director.

Washington metropolitan area
In addition to the city of Washington, the National Capital Region (NCR) includes suburban areas of Maryland and Virginia, but definitions of the region vary. Despite the difficulties of coordinating disparate groups, the Metropolitan Washington Council of Government's (COG's) Health Officers Committee and other regional entities coordinated bioterrorism and infectious disease surveillance efforts and worked together on a variety of public health issues.

Nebraska
Until recently, mostly rural Nebraska had little local public health outside of its largest cities, but legislation passed in 2001 used Tobacco Settlement Funds to fund 16 new multicounty LPHDs. Since then, they have developed comprehensive needs assessments, implemented many health promotion programs, organized surveillance programs, and developed local bioterrorism and emergency preparedness plans.

Comparing case studies
After draft case studies were prepared, we convened a workshop of representatives from all of the sites to discuss and compare the results in terms of rationale, implementation, and impact. To make the cases as comparable as possible, each used a similar outline and framework, based on the four approaches to regionalization discussed previously. In addition to the authors, public health practitioners from the areas featured in the cases and leading national experts in public health practice also participated. The resulting cross-cutting themes are based on the discussions at the workshop.

RESULTS

Although each case study was unique in many respects, comparison revealed similarities with respect to the rationale for creating regional structures. A number of issues arose in the cases, including the relationship between public health regions and preexisting geopolitical jurisdictions, tensions between formal organizational relationships and informal professional networks, as well as issues of leadership, trust, and sustainability. Although case studies can never provide definitive answers, the common experiences of the five cases allow us to address two issues: (*1*) whether regionalization improves preparedness and (*2*) its effect generally on public health.

Rationale and impetus for creating regional structures
The case studies identified a wide range of reasons for creating, and to some extent enhancing, regional structures. In Massachusetts, seven regions and 16 subregions were established by the state health department as part of its preparedness efforts in 2002. The Massachusetts Department of Public Health funds a regional coordinator in each region and distributes funds to a fiscal agent (one of the cities or towns) in each subregion based on an agreed-upon scope of work. A primary reason for creating these regions was that with 351 separate and independent city and town

health authorities, federal preparedness funds would be spread too thinly to be effective if all received a share. Efficient allocation of federal resources played a role in each of the case studies.

Massachusetts Region 4b consists of 27 communities in the Boston suburbs, some of which had already started to collaborate on public health preparedness issues before the state regionalization initiative. To build on the partnership that had already begun, these communities agreed to add others and became one of the state's regions. Unlike most of the other regions, however, the regional coordinator is employed by the fiscal agent, the Cambridge Public Health Department, rather then the state.

In contrast, Nebraska's regions were established before 9/11, when the state's Turning Point program identified the need to strengthen local public health. Other than in a few more urban areas, most of the state's counties had no health departments, so in 2001 the state set up 16 new multicounty health departments to provide essential public health services. These regions have since become an important vehicle for preparedness planning and the distribution of federal funds.

The Northern Illinois Public Health Coalition also was established before 9/11, and subsequently served as a vehicle for enhancing public health preparedness activities in Illinois. Unlike the Nebraska model, however, the Coalition was self-initiated by a number of relatively strong LPHDs rather than by the state health department, in part to advocate for those departments.

Although the public health system in the Washington metropolitan area functions in some respects as a region, there is no single, formal regional structure. The NCR was established by Congress mainly for planning purposes in 1932 and was given official standing by the Department of Homeland Security (DHS). Much of the preparedness planning and response activities in the region are the result of voluntary self-organization through the Washington Metropolitan COG and other governmental and nongovernmental organizations. Experience with WNV and anthrax in 2001 reawakened latent concerns about the need for public health agencies to act together to respond in a coordinated way. Together with the availability of DHS Urban Area Security Initiative (UASI) funds that were awarded regionally, it also reinforced the need for regional planning.

Thus, the case studies confirm findings in the literature about the dual rationale for establishing regions: disease outbreaks and bioterrorist attacks that do not respect geopolitical borders, thereby requiring a regional response, as well as efficient allocation of resources that would be spread too thin if distributed to existing local jurisdictions. In addition, the cases illustrate how the concerns and resources associated with preparedness have reinforced existing efforts to build general public health capacity.

Formal organizational relationships vs. informal professional networks

The case studies illustrated each of the four approaches to regionalization identified by NACCHO, generally with multiple approaches used for different public health functions in each area.

Coordinating occurs when LPHDs work together deliberately to plan events such as trainings or exercises. This was common in regions with relatively well-established, independent health departments such as Northern Illinois and the NCR. Standardizing, which creates uniformity across individual health departments through mutual adoption of one another's planning tools, press releases, and even response procedures, was used less frequently, but typically in the same regions.

Centralizing involves resources for planning or response that are brought together or controlled by a centralized entity. Centralizing was seen in various forms in most of the case studies. New LPHDs created to serve multiple counties in Nebraska is one form. Regional offices such as seen in Northern Virginia with the NCR and Massachusetts, especially Region 4b, have staff members dedicated to preparedness activities that relieve the burden of LPHD staff and are available to assist in emergencies. Perhaps in response to the challenges that were experienced in coordinating the response to an emergency across state lines, the NCR has established central capacities for both surveillance and communication.

Especially in areas where regionalization is new, networking appears to be the most common approach to regionalization. This approach is based on building strong relationships for sharing preparedness information. Networking can lead to coordination of efforts across jurisdictions and may lead to better coordination during a crisis. This is most prominent in the NCR, where the number of jurisdictions and federal agencies involved makes it unlikely that a clear chain of command will ever exist. In this setting, networking is seen as an effective approach to regionalization, not only in planning and other preparedness efforts, but in building social capital by making links between individuals in different agencies that would have to work together during a public health emergency.[18] Indeed, some officials view the current informal arrangement as optimal

rather than just pragmatic, as in their opinion personal relationships will prove more important in responding to a regional public health emergency.[17]

Relationship between public health regions and geopolitical jurisdictions

The case studies illustrate a variety of regional structure, some of which do and others which do not correspond with existing geopolitical jurisdictions and regions created for other purposes. Some of the public health regions, such as those in Illinois and Massachusetts, are created from contiguous groups of health departments. The Chicago Department of Health is included in the Northern Illinois Public Health Coalition along with Cook and adjacent counties, but the City of Boston is not included in Region 4b, which surrounds it. In each of these states, the public health regions consist of a defined group of cities, towns, and counties in one state, although both Massachusetts Region 4b and the Northern Illinois Public Health Coalition have increased in scope in the last five years. Nebraska, on the other hand, combined counties to be served by single health departments. (The new departments, considered "regional" in the context of this analysis, are regarded as "local" in Nebraska.)

The NCR is far more complex. The DHS-designated NCR and the Washington Metropolitan COG both encompass all governments in a given area, although the latter includes one more county than the former. By any definition, the region includes areas in at least two states plus the District of Columbia. States and the federal government are formally included in the NCR but not in the Metropolitan COG. In addition, the Northern Virginia regional office of the Virginia Department of Health (VDH) serves the five Virginia health districts in the NCR (which are themselves part of the centralized VDH), creating a region within a region.

Many of the public health regions are not congruent with emergency planning and other response regions. The Massachusetts Emergency Management Agency, for instance, uses a different set of regions than public health. The Northern Virginia Hospital Alliance includes hospitals in the health-care market but outside the VDH's northern regional office. In most cases, media markets cover a broader area than public health districts.

The lack of congruence in regional boundaries presents a number of challenges to public health practice and preparedness. First, planning and other preparedness activities are more complex and time-consuming if individual health departments have to coordinate with multiple partner agencies for different functions.

Second, emergency response may be less effective than if a consistent group of partner agencies had been working together consistently and regularly. In addition, public health authorities and priority setting generally follow geopolitical jurisdictions, and public health regions that do not correspond to jurisdictions may run the risk of not being "owned" by any of the parties that control resources or have authority to act during an emergency. This problem is particularly acute in the NCR, as public health authorities generally follow state lines, making joint decision-making complex. However, neither infectious agents nor media markets (which health departments would use to communicate with the public during a public health emergency) respect geopolitical boundaries, so a balance is needed between official boundaries and those suggested by demographic determinants of disease spread and used by partner agencies.

Governance and sustainability

Public health regions that do not correspond to geopolitical boundaries can create as well as solve problems. Because both public health funding and, to some extent, authorities and responsibilities reside with LPHDs, policies must be coordinated and memoranda of understanding (MOA) created to describe how resources will be shared within regions. Noncongruent regions also can be perceived as siphoning resources and jobs from local to regional entities, over which local policy makers have less control. Local governments, however, are more willing to share resources for functions that are less commonly needed—swimming pool inspectors in Massachusetts, for instance—or for functions that were previously not available at the local level, such as epidemiologic capacity.

The case studies suggest that citing the need to provide the 10 Essential Public Health Services or all of the elements of NACCHO's Operational Definition of Public Health in every jurisdiction is not enough of an impetus to create regions.[19,20] Rather, the perceived need for regional response—seen through examples such as WNV—can overcome home rule barriers. This will only happen, however, if there is a perception among public health officials, partners, and elected officials that at the end of the day, regional collaboration will be worth it.

Issues of leadership and trust emerged in most of the case studies, and seemed to be related to the sustainability of regional structures. Massachusetts Region 4b, for instance, started with a small group of city and town health departments in the WNV crisis in 2000, grew to 15 by 2002, and was further expanded to 27 when the state formed public health regions. The

Cambridge Department of Public Health, which was one of the original health departments and became the fiscal agent for Region 4b (i.e., received the state funding and employed a regional coordinator paid by the state), had to work with its peers to ensure that it was not perceived as driving the region.

In the NCR, collaboration in developing proposals for the federal UASI grant (which required the region to work together) is seen as a positive force for bringing state and local public health officials and public health partners from the entire region together, likely strengthening the relationships that will be required to respond to public health emergencies in the future. However, to the extent that these relationships are dominated by competition for limited resources, it is possible that this process could become divisive.

The case studies suggest that developing leadership and building trust among the health departments in a region and with their partners, as well as formal instruments, are key elements in building and sustaining an effective regional preparedness program and response capabilities. As discussed previously, it seems as if the social capital that can be created by networking should also help to effectively govern and sustain regional activities.

Does regionalization improve preparedness?

There are two logical reasons for creating public health preparedness regions: (*1*) disease outbreaks do not respect geopolitical boundaries, so some sort of coordination is needed for an effective public health response, and (*2*) regionalization represents a more efficient use of resources than distributing resources to each of many LPHDs. While case studies generally do not provide hard evidence of effectiveness, the cases we examined illustrate and do not contradict these ideas. Moreover, the examples examined by our group, and the comparison across cases, also provide some suggestions that the regionalization efforts that we studied have had a positive effect on public health preparedness. However, it should be stressed that the specific results may depend on setting, existing resources, and the type of regionalization that was used.

In particular, the case studies provide many examples in which progress has demonstrably been made in activities that are thought to improve preparedness. These include planning and coordination; development of MOA among public health agencies and partners; and development of local and regional capacity, training, and exercises. The case studies also suggest that investments in IT can build regional preparedness in two ways. First, IT can help coordinate activities during the planning phase and during an emergency

response. In addition, IT enables regional capacity in ways that were not previously available. For example, it is now possible for an epidemiologist with an Internet connection and a phone line to serve a large geographical area, only going into the field when necessary.

The most consistent, and perhaps the strongest effect of the development of regional structures was its effect on building social capital—connections among health departments in the region as well as with a variety of public health partner agencies. Presumably, these connections will prove useful in coordinating activities in future public health emergencies.

In addition, the case studies provide examples in which regional preparedness efforts seem to have made a difference in terms of response to events. One example comes from the NCR, where the ESSENCE II regional surveillance system provided the region with negative confirmation of a tularemia false alarm in 2005.[17] Similarly, the preparedness staff in Massachusetts Region 4b was able to set up regional vaccine clinics in the autumn of 2004, when production problems caused a national shortage of vaccine.[2] These events are smaller in scale than a bioterrorist attack or pandemic influenza might cause, so the positive response does not mean that the public health would do as well in a more challenging event. Given the challenges of assessing preparedness to events that are rare, however, any success is evidence that regionalization efforts are moving preparedness in the right direction.

Does regionalization improve public health generally?

Although the primary focus of this analysis was on preparedness issues, there is reason to believe that the development of regional structures could improve the delivery of public health services in other areas. First, it should be noted that in Illinois and Nebraska, the regional structures we studied were in fact set up to address general public health concerns before the heightened concern about bioterrorism and other public health emergencies that emerged after 9/11. The other two areas also had some history of regional efforts before 9/11. So it should not be surprising to find that regional structures improve public health functioning in areas beyond preparedness.

Indirect evidence comes from the fact that public health needs during an emergency are not fundamentally different than at other times. Television and newspaper ads are sometimes used to raise public awareness of obesity or the availability of childhood vaccines, even though media markets frequently span multiple public health jurisdictions. Similarly, efficiency concerns often suggest shared capacities for prenatal

or sexually transmitted disease clinics. Regional epidemiology offices capable of detecting bioterrorism or pandemic influenza can also be used to monitor the spread of seasonal influenza and chronic disease risk factors more efficiently than parallel offices in each jurisdiction, and help communicate the results at the same time.[21] The development of connections among public health agencies in a region and public health partners for preparedness purposes may also prove useful in other areas.

Although they are seeking to prepare for unknown future crises, community leaders must think about preparedness in terms of day-to-day activities. As a result, the profile of public health has been raised, and preparedness concerns are forcing communities to think about public health structures in a way that has not been done in decades. What is not known, however, is whether preparedness demands will draw resources and attention from other areas rather than contribute to public health capacities in general.

CONCLUSIONS

Most states have responded to the increased interest in and funding for public health preparedness by setting up intrastate regional structures, but the rationale for regional structures, the way that regionalization is implemented, and presumably the impact of this organizational change vary considerably. To learn from areas that have adopted a regional approach, we have used comparative case studies in Massachusetts, Northern Illinois, Nebraska, and the NCR to (*1*) document the variation in the rationale for creating regional public health structures; (*2*) understand how these structures have been organized, implemented, and governed; and (*3*) assess the current and likely impact of regional structures on public health preparedness and public health systems more generally.

We found that the impetus for forming regions was some combination of the following: a crisis or perceived need for a coordinated response, a need to build local public health capacity, and an effort to use federal preparedness funds more efficiently. The relationship between public health regions and the geopolitical jurisdictions in which they sit was quite complex. Some involved combinations of LPHDs, and one set up new health departments for groups of counties. In the NCR, there were multiple definitions of the region, including some that crossed state lines. The regions varied in terms of their congruence with regional structures for partner agencies, such as emergency management agencies, as well as hospital and health services markets and organizational structure. Some of the regions focused on building formal organizational relationships to coordinate and sometimes standardize preparedness and response activities, or build regional capacity, while others focused on building informal professional networks. It is not clear whether formal organizational structures or the professional networks built through regionalization efforts have the largest effect on building social capital. Whatever the approach to regionalization, however, it is clear that strong leadership skills and trust are required for effective planning, emergency response, and sustainability.

Does regionalization improve emergency preparedness? Logically, regionalization allows for more efficient use of resources and, indeed, disease outbreaks do not respect geopolitical boundaries, so coordination is needed. Although the specific answer may depend on the setting, existing resources, and the approach to regionalization, the case studies demonstrated progress in terms of planning and coordination; MOA about coordinating responses and sharing resources; development of local and regional capacity, training, and exercises; and development of professional networks. The case studies also showed effects in terms of the public health response to the 2004 flu vaccine shortage in Massachusetts and the 2005 anthrax and tularemia alarms in the NCR.

Perhaps more importantly, one might ask whether regionalization improves public health generally. The same arguments about sharing resources and the need for coordinated response apply to preparedness. And the case studies do identify a number of areas where regional capacities address other needs, such as general epidemiology in the NCR. It seems likely that preparedness concerns are forcing communities to think about public health structures in a way that has not been done in decades, and that network development may be creating social capital that helps with other concerns. But concerns that preparedness efforts were drawing resources and attention from other areas of public health were also heard.

Research needs

While the rationale for regionalization in public health is strong and efforts to create regions seem to be common, very few of the changes that have been made in recent years have been described in the public health literature. The case studies that we prepared illustrate a range of different approaches to regionalization, but a more systematic effort documenting the changes that have taken place at the local level in the U.S. would provide useful information for public health policy makers.

By their nature, case studies cannot provide strong

evidence of efficacy, so the conclusions in this article should be read as suggestions rather than definitive findings. However, because many states see regionalization as a useful approach to improving preparedness and perhaps other public health functions, more research is needed to answer three questions:

- Does regionalization have a positive net impact on preparedness and other public health services?

- Are some versions of regionalization more effective than others for preparedness or to achieve other public health goals?

- Are some versions of regionalization more effective than others in different health department types, geographical areas, or settings?

Developing rigorous and credible empirical evidence to answer these questions is a major challenge for public health services research. Quantitative studies require valid and reliable measures of both inputs (dimensions of regionalization) and outputs (preparedness), neither of which is currently well-developed. Measures of preparedness are also needed to ensure accountability for investments in public health infrastructure and to guide quality improvement efforts. As progress is made in developing them, the same measures can be applied to studying the impact of various forms of regionalization. In the meantime, objectively documenting the experiments that state and local public health agencies have undertaken in recent years, along with their rationale and apparent effect, may be the best approach to learning from experience about the efficacy of regionalization for preparedness and other public health purposes.

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